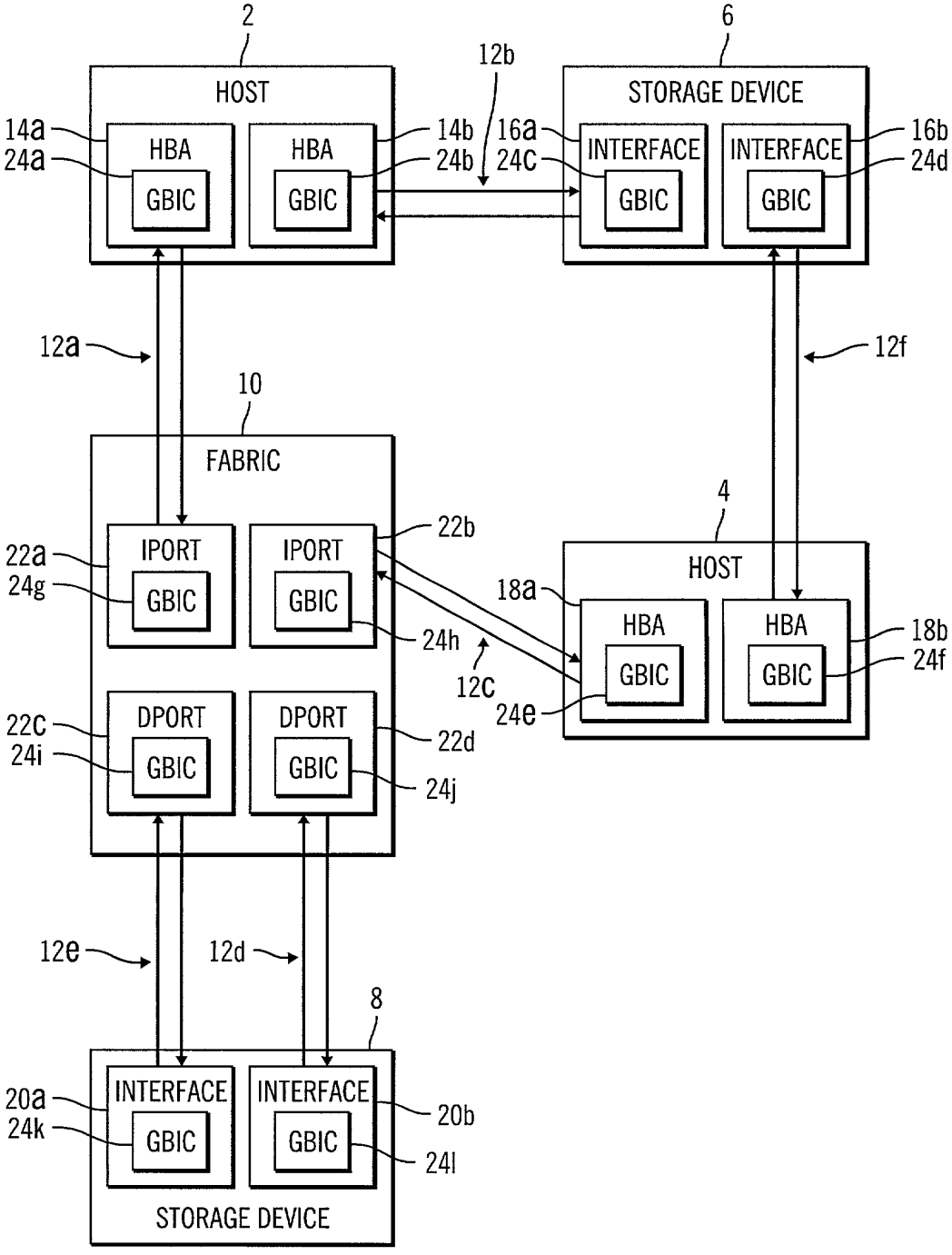

2
HOST
12b
6
STORAGE DEVICE
14a
24a
HBA
GBIC
HBA
GBIC
14b
24b
16a
24c
INTERFACE
GBIC
INTERFACE
GBIC
16b
24d
12a
12f
10
FABRIC
4
HOST
22a
24g
IPORT
GBIC
IPORT
GBIC
22b
18a
HBA
GBIC
HBA
GBIC
18b
24f
24h
12c
24e
22c
24i
DPORT
GBIC
DPORT
GBIC
22d
24j
12e
12d
8
20a
24k
INTERFACE
GBIC
INTERFACE
GBIC
20b
24l
STORAGE DEVICE

FIG. 1

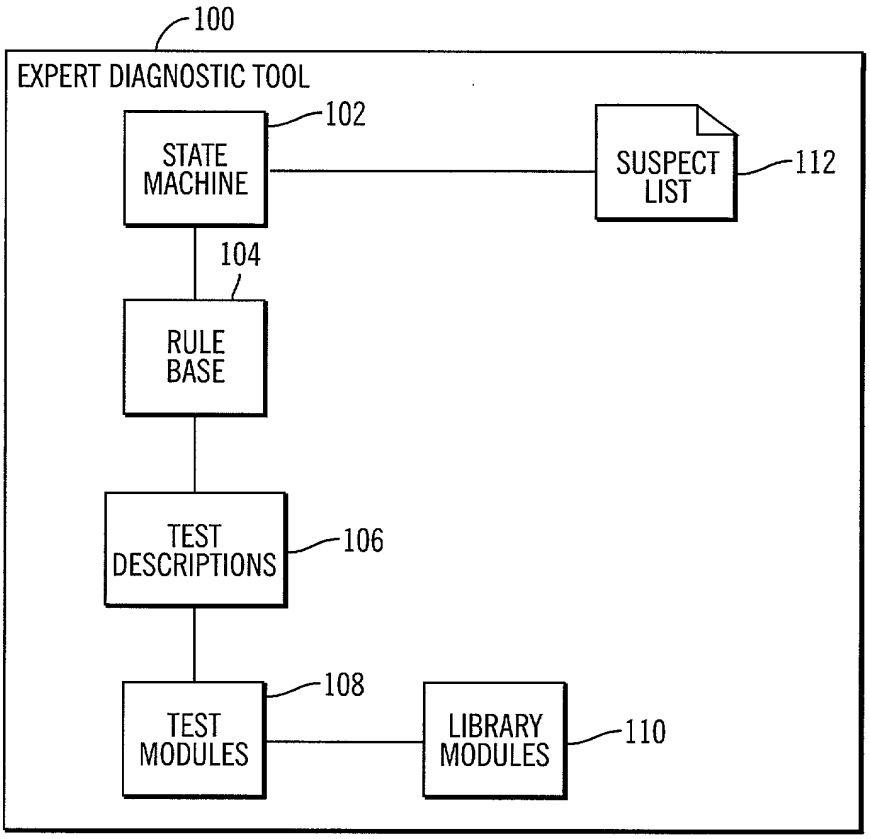
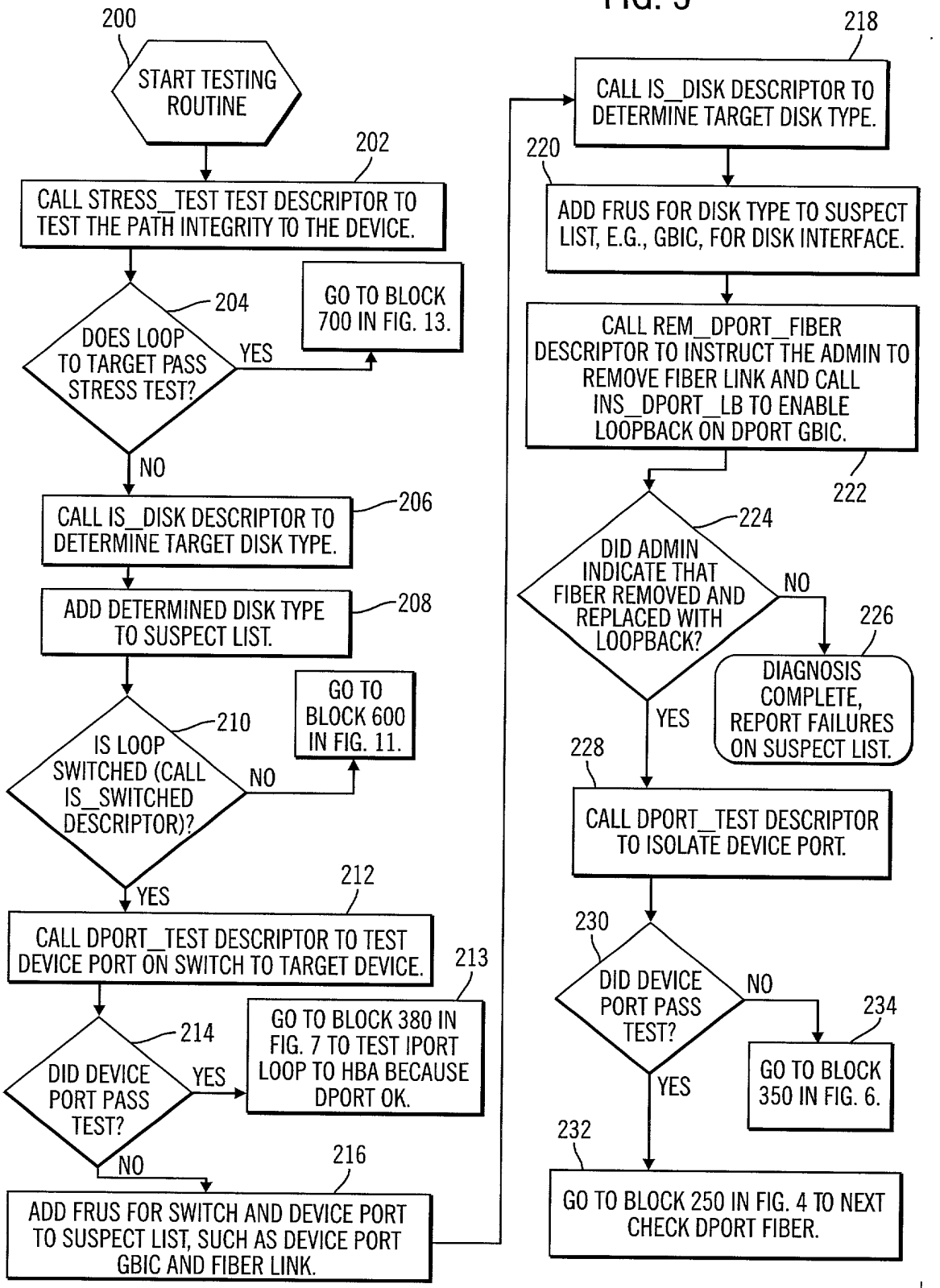

100
EXPERT DIAGNOSTIC TOOL
102
STATE MACHINE
SUSPECT LIST
112
104
RULE BASE
TEST DESCRIPTIONS
106
108
TEST MODULES
LIBRARY MODULES
110

FIG. 2

FIG. 3


200
START TESTING ROUTINE
202
CALL STRESS_TEST TEST DESCRIPTOR TO TEST THE PATH INTEGRITY TO THE DEVICE.
204
DOES LOOP TO TARGET PASS STRESS TEST?
YES
GO TO BLOCK 700 IN FIG. 13.
NO
206
CALL IS_DISK DESCRIPTOR TO DETERMINE TARGET DISK TYPE.
208
ADD DETERMINED DISK TYPE TO SUSPECT LIST.
210
IS LOOP SWITCHED (CALL IS_SWITCHED DESCRIPTOR)?
NO
GO TO BLOCK 600 IN FIG. 11.
YES
212
CALL DPORT_TEST DESCRIPTOR TO TEST DEVICE PORT ON SWITCH TO TARGET DEVICE.
213
214
DID DEVICE PORT PASS TEST?
YES
GO TO BLOCK 380 IN FIG. 7 TO TEST IPORT LOOP TO HBA BECAUSE DPORT OK.
NO
216
ADD FRUS FOR SWITCH AND DEVICE PORT TO SUSPECT LIST, SUCH AS DEVICE PORT GBIC AND FIBER LINK.
218
CALL IS_DISK DESCRIPTOR TO DETERMINE TARGET DISK TYPE.
220
ADD FRUS FOR DISK TYPE TO SUSPECT LIST, E.G., GBIC, FOR DISK INTERFACE.
CALL REM_DPORT_FIBER DESCRIPTOR TO INSTRUCT THE ADMIN TO REMOVE FIBER LINK AND CALL INS_DPORT_LB TO ENABLE LOOPBACK ON DPORT GBIC.
222
224
DID ADMIN INDICATE THAT FIBER REMOVED AND REPLACED WITH LOOPBACK?
NO
226
DIAGNOSIS COMPLETE, REPORT FAILURES ON SUSPECT LIST.
YES
228
CALL DPORT_TEST DESCRIPTOR TO ISOLATE DEVICE PORT.
230
DID DEVICE PORT PASS TEST?
NO
234
GO TO BLOCK 350 IN FIG. 6.
YES
232
GO TO BLOCK 250 IN FIG. 4 TO NEXT CHECK DPORT FIBER.

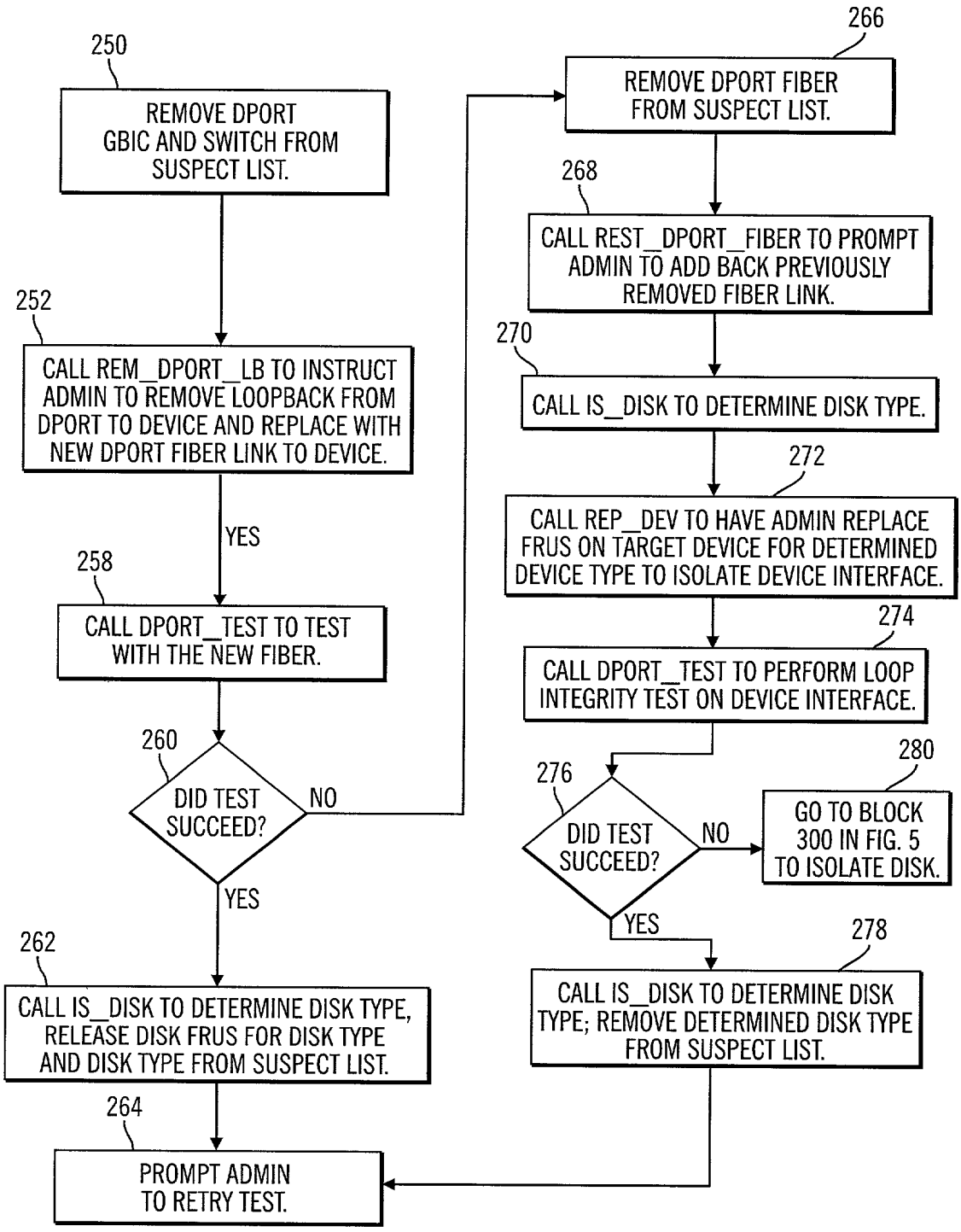

250
REMOVE DPORT GBIC AND SWITCH FROM SUSPECT LIST.
252
CALL REM_DPORT_LB TO INSTRUCT ADMIN TO REMOVE LOOPBACK FROM DPORT TO DEVICE AND REPLACE WITH NEW DPORT FIBER LINK TO DEVICE.
YES
258
CALL DPORT_TEST TO TEST WITH THE NEW FIBER.
260
DID TEST SUCCEED?
NO
YES
262
CALL IS_DISK TO DETERMINE DISK TYPE, RELEASE DISK FRUS FOR DISK TYPE AND DISK TYPE FROM SUSPECT LIST.
264
PROMPT ADMIN TO RETRY TEST.
266
REMOVE DPORT FIBER FROM SUSPECT LIST.
268
CALL REST_DPORT_FIBER TO PROMPT ADMIN TO ADD BACK PREVIOUSLY REMOVED FIBER LINK.
270
CALL IS_DISK TO DETERMINE DISK TYPE.
272
CALL REP_DEV TO HAVE ADMIN REPLACE FRUS ON TARGET DEVICE FOR DETERMINED DEVICE TYPE TO ISOLATE DEVICE INTERFACE.
274
CALL DPORT_TEST TO PERFORM LOOP INTEGRITY TEST ON DEVICE INTERFACE.
276
DID TEST SUCCEED?
NO
280
GO TO BLOCK 300 IN FIG. 5 TO ISOLATE DISK.
YES
278
CALL IS_DISK TO DETERMINE DISK TYPE; REMOVE DETERMINED DISK TYPE FROM SUSPECT LIST.

FIG. 4

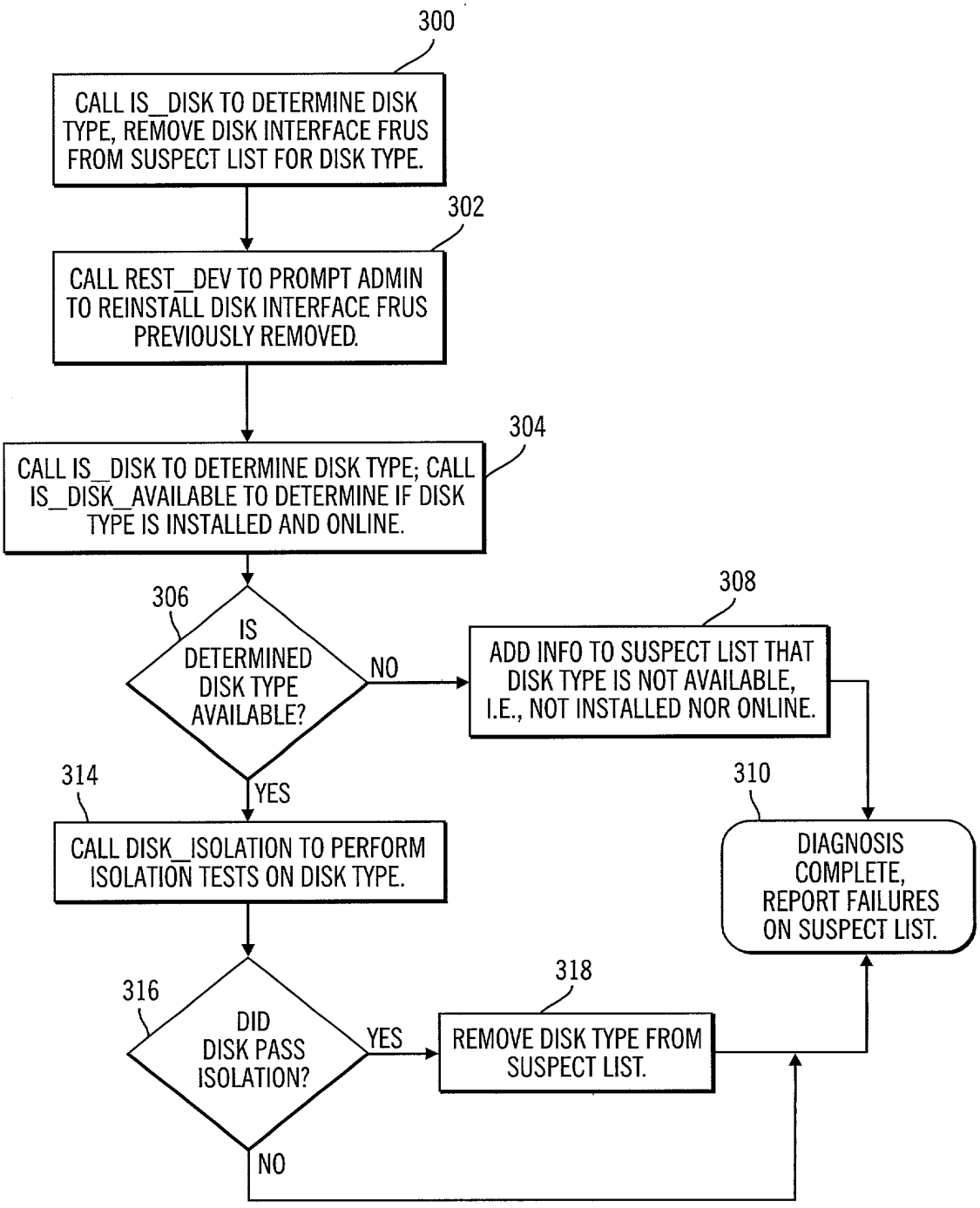

300
CALL IS_DISK TO DETERMINE DISK TYPE, REMOVE DISK INTERFACE FRUS FROM SUSPECT LIST FOR DISK TYPE.
302
CALL REST_DEV TO PROMPT ADMIN TO REINSTALL DISK INTERFACE FRUS PREVIOUSLY REMOVED.
304
CALL IS_DISK TO DETERMINE DISK TYPE; CALL IS_DISK_AVAILABLE TO DETERMINE IF DISK TYPE IS INSTALLED AND ONLINE.
306
IS DETERMINED DISK TYPE AVAILABLE?
NO
308
ADD INFO TO SUSPECT LIST THAT DISK TYPE IS NOT AVAILABLE, I.E., NOT INSTALLED NOR ONLINE.
YES
314
CALL DISK_ISOLATION TO PERFORM ISOLATION TESTS ON DISK TYPE.
316
DID DISK PASS ISOLATION?
YES
318
REMOVE DISK TYPE FROM SUSPECT LIST.
NO
310
DIAGNOSIS COMPLETE, REPORT FAILURES ON SUSPECT LIST.

FIG. 5

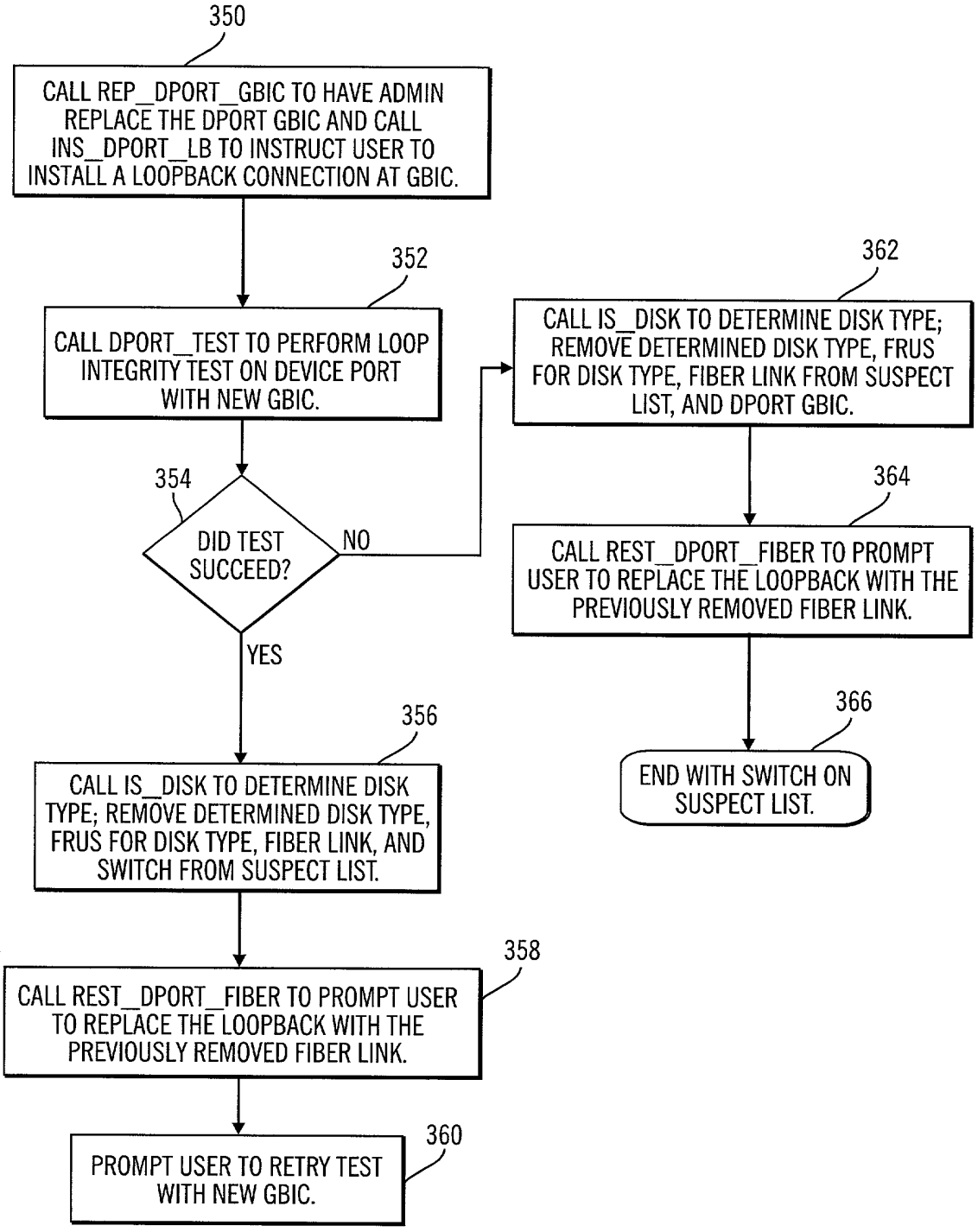

350
CALL REP_DPORT_GBIC TO HAVE ADMIN REPLACE THE DPORT GBIC AND CALL INS_DPORT_LB TO INSTRUCT USER TO INSTALL A LOOPBACK CONNECTION AT GBIC.
352
CALL DPORT_TEST TO PERFORM LOOP INTEGRITY TEST ON DEVICE PORT WITH NEW GBIC.
354
DID TEST SUCCEED?
NO
YES
362
CALL IS_DISK TO DETERMINE DISK TYPE; REMOVE DETERMINED DISK TYPE, FRUS FOR DISK TYPE, FIBER LINK FROM SUSPECT LIST, AND DPORT GBIC.
364
CALL REST_DPORT_FIBER TO PROMPT USER TO REPLACE THE LOOPBACK WITH THE PREVIOUSLY REMOVED FIBER LINK.
366
END WITH SWITCH ON SUSPECT LIST.
356
CALL IS_DISK TO DETERMINE DISK TYPE; REMOVE DETERMINED DISK TYPE, FRUS FOR DISK TYPE, FIBER LINK, AND SWITCH FROM SUSPECT LIST.
358
CALL REST_DPORT_FIBER TO PROMPT USER TO REPLACE THE LOOPBACK WITH THE PREVIOUSLY REMOVED FIBER LINK.
360
PROMPT USER TO RETRY TEST WITH NEW GBIC.

FIG. 6

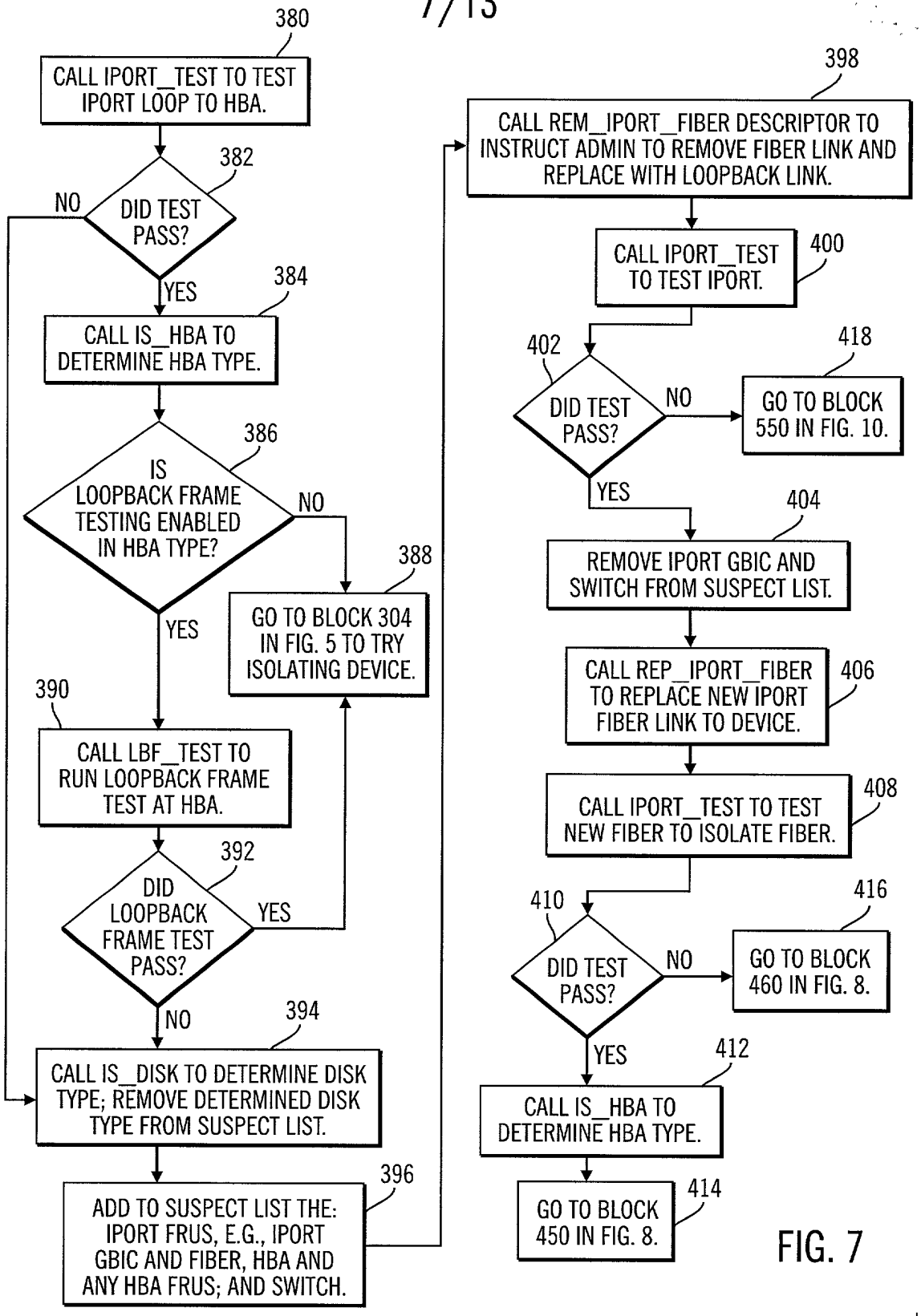


FIG. 7

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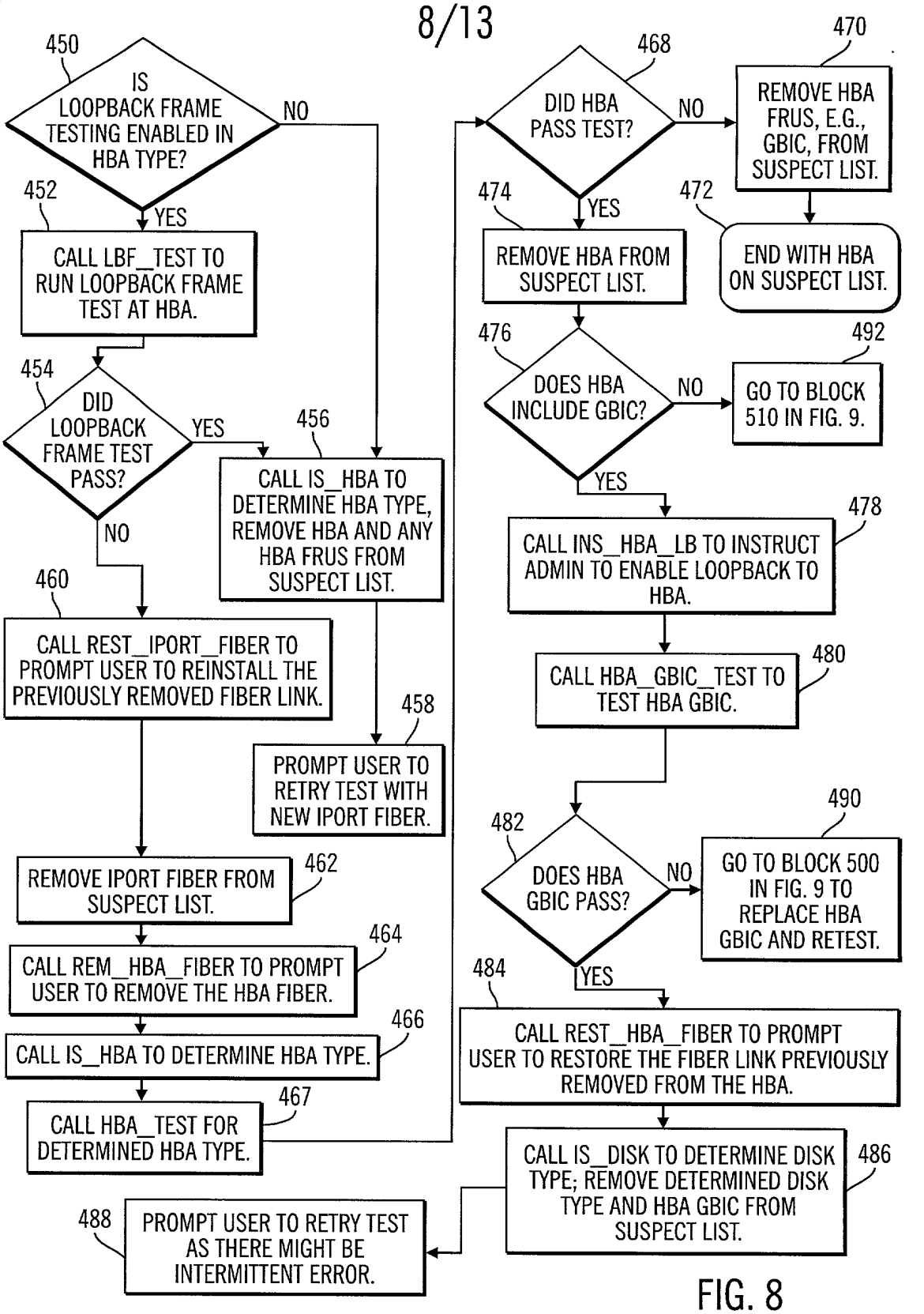
450
IS LOOPBACK FRAME TESTING ENABLED IN HBA TYPE?
NO
YES
452
CALL LBF_TEST TO RUN LOOPBACK FRAME TEST AT HBA.
454
DID LOOPBACK FRAME TEST PASS?
YES
NO
456
CALL IS_HBA TO DETERMINE HBA TYPE, REMOVE HBA AND ANY HBA FRUS FROM SUSPECT LIST.
458
PROMPT USER TO RETRY TEST WITH NEW IPORT FIBER.
460
CALL REST_IPORT_FIBER TO PROMPT USER TO REINSTALL THE PREVIOUSLY REMOVED FIBER LINK.
462
REMOVE IPORT FIBER FROM SUSPECT LIST.
464
CALL REM_HBA_FIBER TO PROMPT USER TO REMOVE THE HBA FIBER.
466
CALL IS_HBA TO DETERMINE HBA TYPE.
467
CALL HBA_TEST FOR DETERMINED HBA TYPE.
468
DID HBA PASS TEST?
NO
470
REMOVE HBA FRUS, E.G., GBIC, FROM SUSPECT LIST.
472
END WITH HBA ON SUSPECT LIST.
474
YES
REMOVE HBA FROM SUSPECT LIST.
476
DOES HBA INCLUDE GBIC?
NO
492
GO TO BLOCK 510 IN FIG. 9.
YES
478
CALL INS_HBA_LB TO INSTRUCT ADMIN TO ENABLE LOOPBACK TO HBA.
480
CALL HBA_GBIC_TEST TO TEST HBA GBIC.
482
DOES HBA GBIC PASS?
NO
490
GO TO BLOCK 500 IN FIG. 9 TO REPLACE HBA GBIC AND RETEST.
YES
484
CALL REST_HBA_FIBER TO PROMPT USER TO RESTORE THE FIBER LINK PREVIOUSLY REMOVED FROM THE HBA.
486
CALL IS_DISK TO DETERMINE DISK TYPE; REMOVE DETERMINED DISK TYPE AND HBA GBIC FROM SUSPECT LIST.
488
PROMPT USER TO RETRY TEST AS THERE MIGHT BE INTERMITTENT ERROR.

FIG. 8

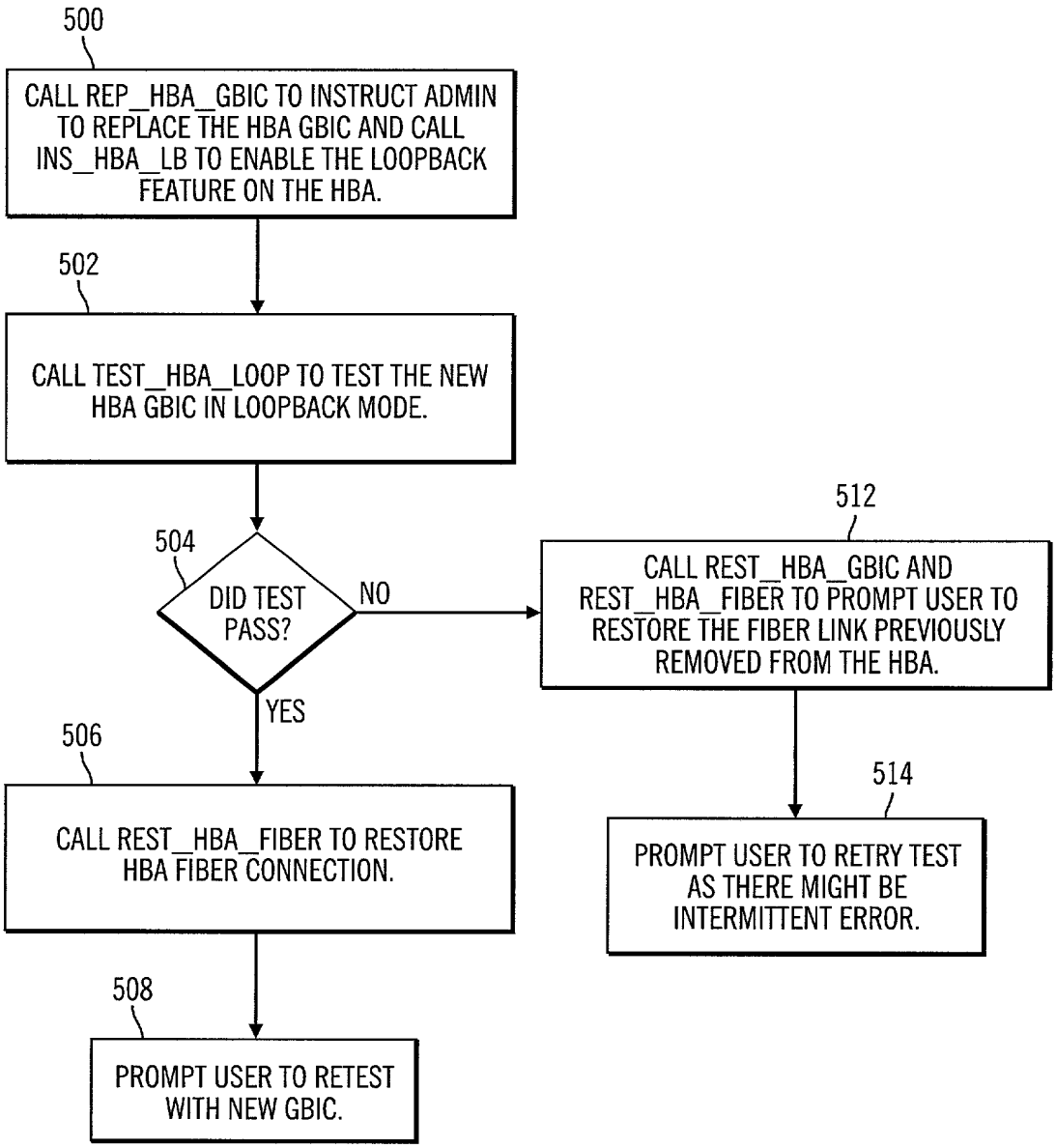
500
CALL REP_HBA_GBIC TO INSTRUCT ADMIN TO REPLACE THE HBA GBIC AND CALL INS_HBA_LB TO ENABLE THE LOOPBACK FEATURE ON THE HBA.
502
CALL TEST_HBA_LOOP TO TEST THE NEW HBA GBIC IN LOOPBACK MODE.
504
DID TEST PASS?
NO
YES
512
CALL REST_HBA_GBIC AND REST_HBA_FIBER TO PROMPT USER TO RESTORE THE FIBER LINK PREVIOUSLY REMOVED FROM THE HBA.
514
PROMPT USER TO RETRY TEST AS THERE MIGHT BE INTERMITTENT ERROR.
506
CALL REST_HBA_FIBER TO RESTORE HBA FIBER CONNECTION.
508
PROMPT USER TO RETEST WITH NEW GBIC.

FIG. 9

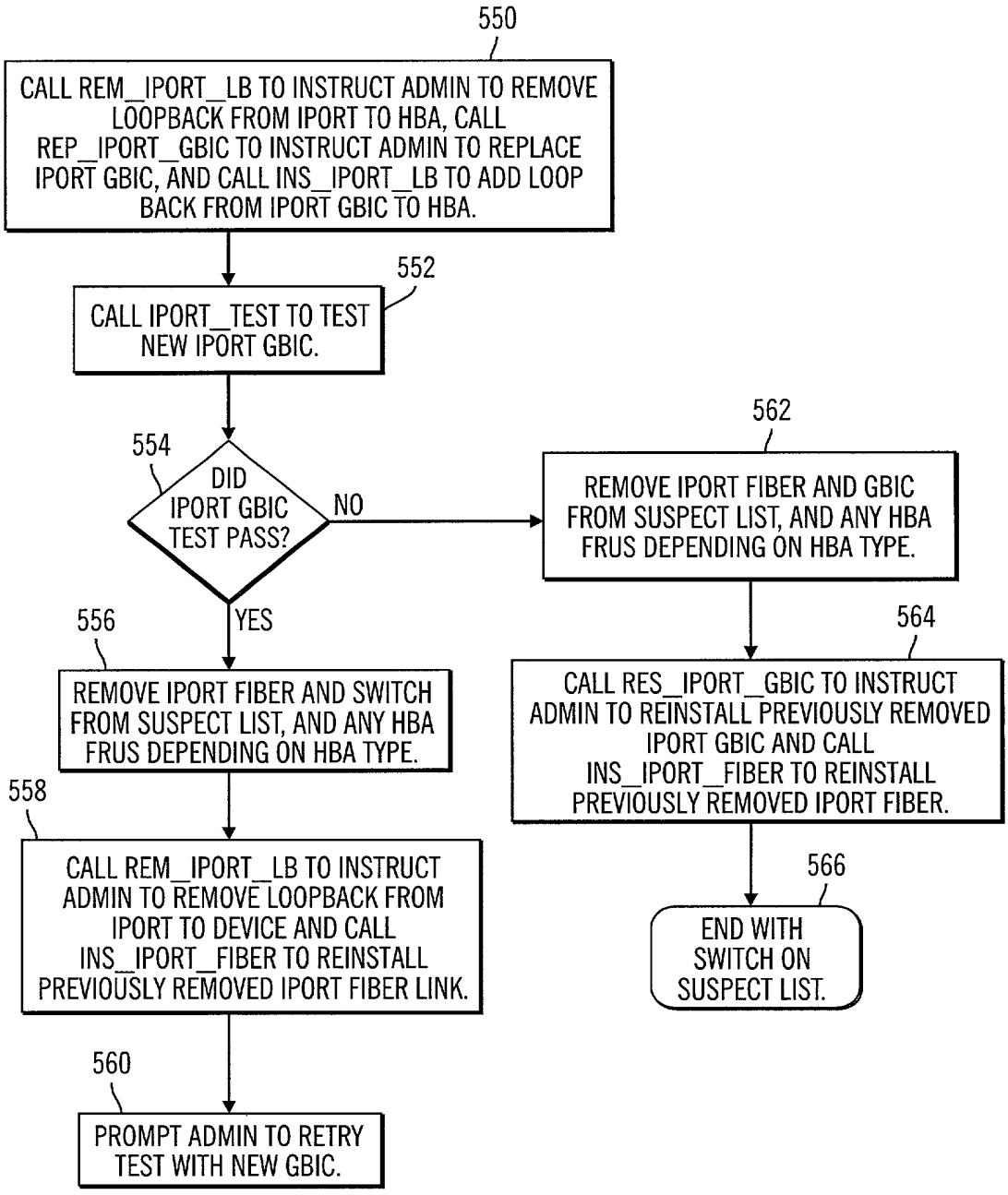
550
CALL REM_IPORT_LB TO INSTRUCT ADMIN TO REMOVE LOOPBACK FROM IPORT TO HBA, CALL REP_IPORT_GBIC TO INSTRUCT ADMIN TO REPLACE IPORT GBIC, AND CALL INS_IPORT_LB TO ADD LOOP BACK FROM IPORT GBIC TO HBA.
552
CALL IPORT_TEST TO TEST NEW IPORT GBIC.
554
DID IPORT GBIC TEST PASS?
NO
YES
562
REMOVE IPORT FIBER AND GBIC FROM SUSPECT LIST, AND ANY HBA FRUS DEPENDING ON HBA TYPE.
556
REMOVE IPORT FIBER AND SWITCH FROM SUSPECT LIST, AND ANY HBA FRUS DEPENDING ON HBA TYPE.
564
CALL RES_IPORT_GBIC TO INSTRUCT ADMIN TO REINSTALL PREVIOUSLY REMOVED IPORT GBIC AND CALL INS_IPORT_FIBER TO REINSTALL PREVIOUSLY REMOVED IPORT FIBER.
558
CALL REM_IPORT_LB TO INSTRUCT ADMIN TO REMOVE LOOPBACK FROM IPORT TO DEVICE AND CALL INS_IPORT_FIBER TO REINSTALL PREVIOUSLY REMOVED IPORT FIBER LINK.
566
END WITH SWITCH ON SUSPECT LIST.
560
PROMPT ADMIN TO RETRY TEST WITH NEW GBIC.

FIG. 10

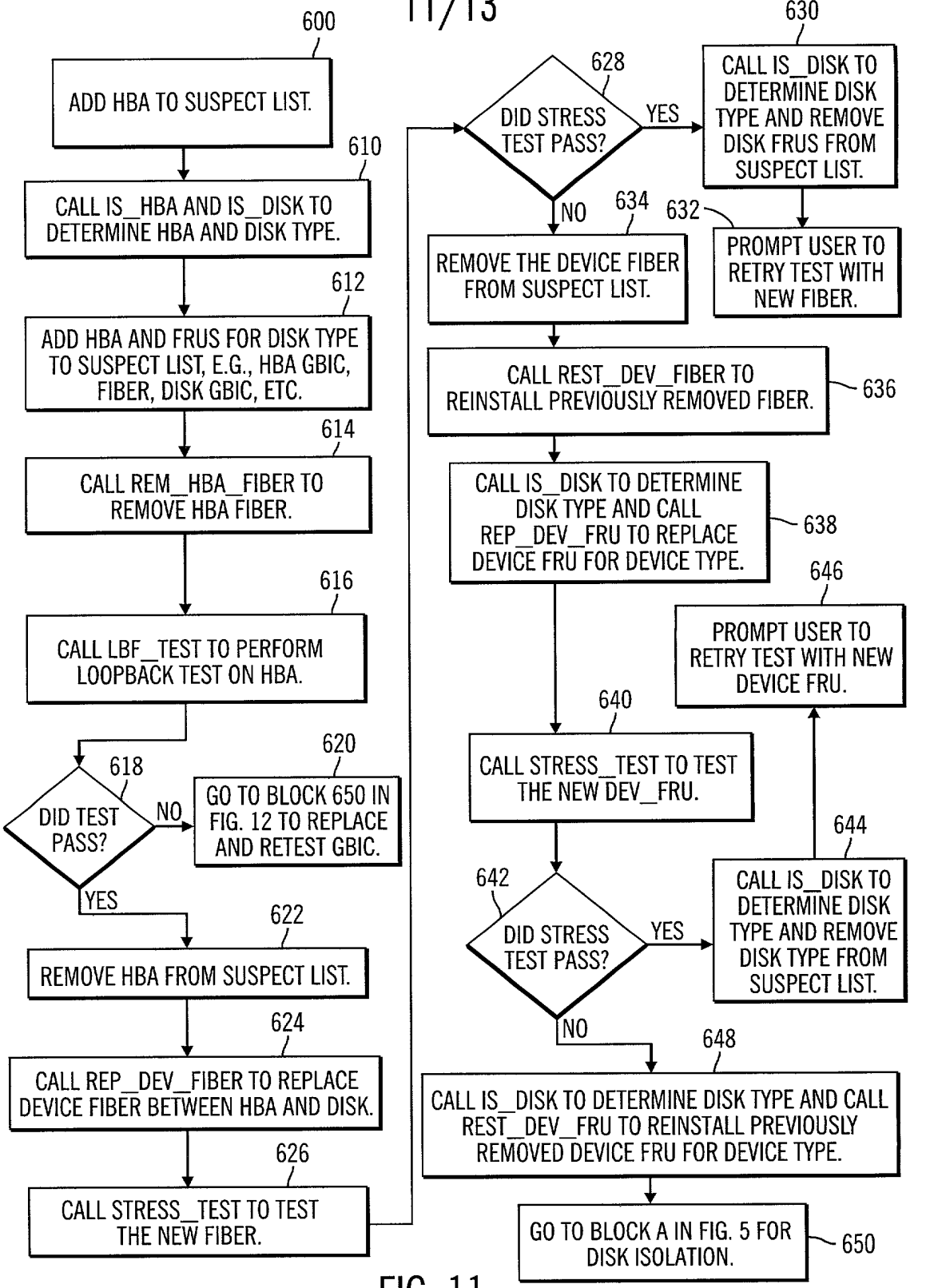
600
ADD HBA TO SUSPECT LIST.
610
CALL IS_HBA AND IS_DISK TO DETERMINE HBA AND DISK TYPE.
612
ADD HBA AND FRUS FOR DISK TYPE TO SUSPECT LIST, E.G., HBA GBIC, FIBER, DISK GBIC, ETC.
614
CALL REM_HBA_FIBER TO REMOVE HBA FIBER.
616
CALL LBF_TEST TO PERFORM LOOPBACK TEST ON HBA.
618
DID TEST PASS?
NO
620
GO TO BLOCK 650 IN FIG. 12 TO REPLACE AND RETEST GBIC.
YES
622
REMOVE HBA FROM SUSPECT LIST.
624
CALL REP_DEV_FIBER TO REPLACE DEVICE FIBER BETWEEN HBA AND DISK.
626
CALL STRESS_TEST TO TEST THE NEW FIBER.
628
DID STRESS TEST PASS?
YES
630
CALL IS_DISK TO DETERMINE DISK TYPE AND REMOVE DISK FRUS FROM SUSPECT LIST.
632
PROMPT USER TO RETRY TEST WITH NEW FIBER.
NO
634
REMOVE THE DEVICE FIBER FROM SUSPECT LIST.
636
CALL REST_DEV_FIBER TO REINSTALL PREVIOUSLY REMOVED FIBER.
638
CALL IS_DISK TO DETERMINE DISK TYPE AND CALL REP_DEV_FRU TO REPLACE DEVICE FRU FOR DEVICE TYPE.
646
PROMPT USER TO RETRY TEST WITH NEW DEVICE FRU.
640
CALL STRESS_TEST TO TEST THE NEW DEV_FRU.
642
DID STRESS TEST PASS?
YES
644
CALL IS_DISK TO DETERMINE DISK TYPE AND REMOVE DISK TYPE FROM SUSPECT LIST.
NO
648
CALL IS_DISK TO DETERMINE DISK TYPE AND CALL REST_DEV_FRU TO REINSTALL PREVIOUSLY REMOVED DEVICE FRU FOR DEVICE TYPE.
GO TO BLOCK A IN FIG. 5 FOR DISK ISOLATION.
650

FIG. 11

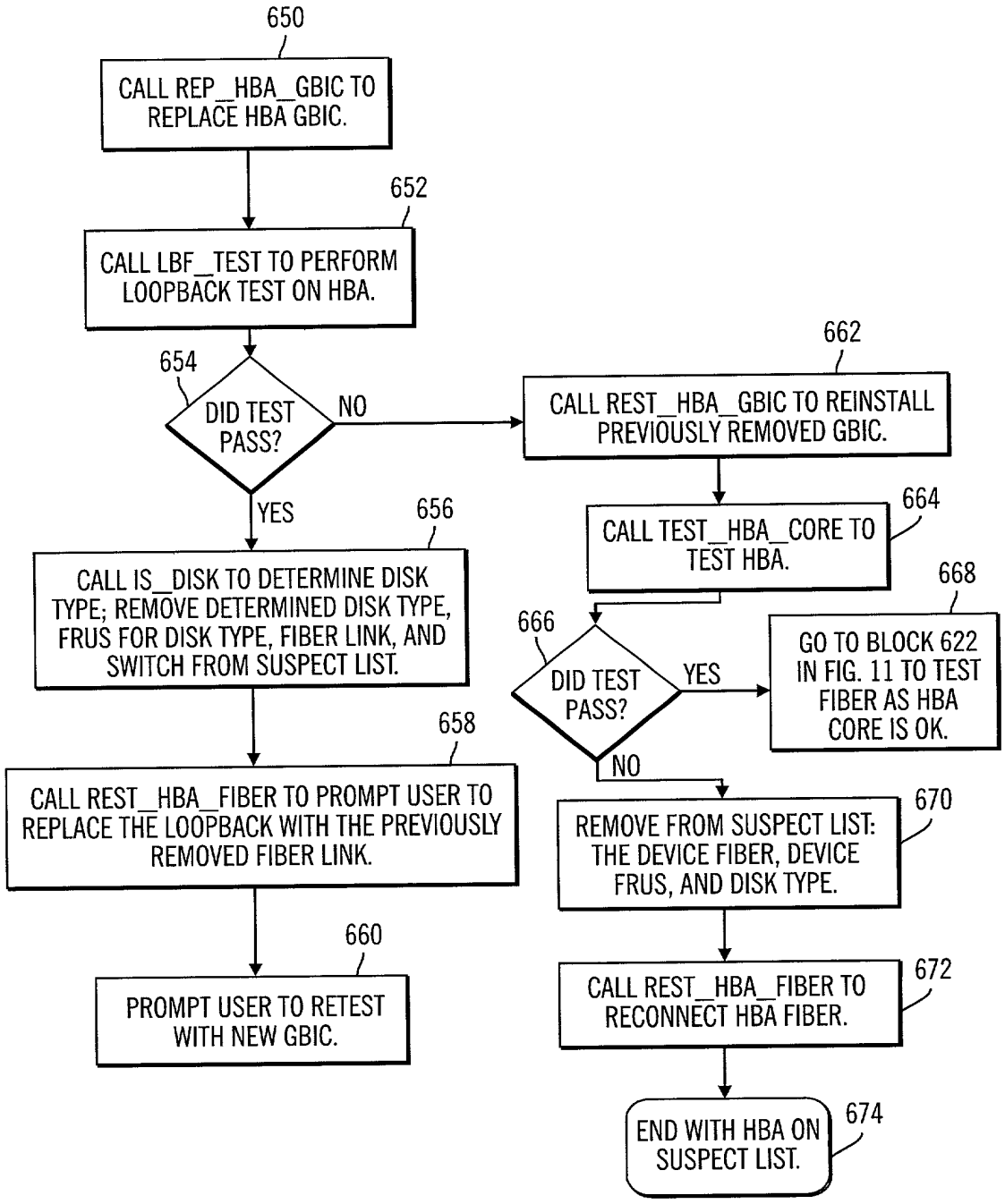
650
CALL REP_HBA_GBIC TO REPLACE HBA GBIC.
652
CALL LBF_TEST TO PERFORM LOOPBACK TEST ON HBA.
654
DID TEST PASS?
NO
YES
662
CALL REST_HBA_GBIC TO REINSTALL PREVIOUSLY REMOVED GBIC.
664
CALL TEST_HBA_CORE TO TEST HBA.
666
DID TEST PASS?
YES
668
GO TO BLOCK 622 IN FIG. 11 TO TEST FIBER AS HBA CORE IS OK.
NO
670
REMOVE FROM SUSPECT LIST: THE DEVICE FIBER, DEVICE FRUS, AND DISK TYPE.
672
CALL REST_HBA_FIBER TO RECONNECT HBA FIBER.
674
END WITH HBA ON SUSPECT LIST.
656
CALL IS_DISK TO DETERMINE DISK TYPE; REMOVE DETERMINED DISK TYPE, FRUS FOR DISK TYPE, FIBER LINK, AND SWITCH FROM SUSPECT LIST.
658
CALL REST_HBA_FIBER TO PROMPT USER TO REPLACE THE LOOPBACK WITH THE PREVIOUSLY REMOVED FIBER LINK.
660
PROMPT USER TO RETEST WITH NEW GBIC.

FIG. 12

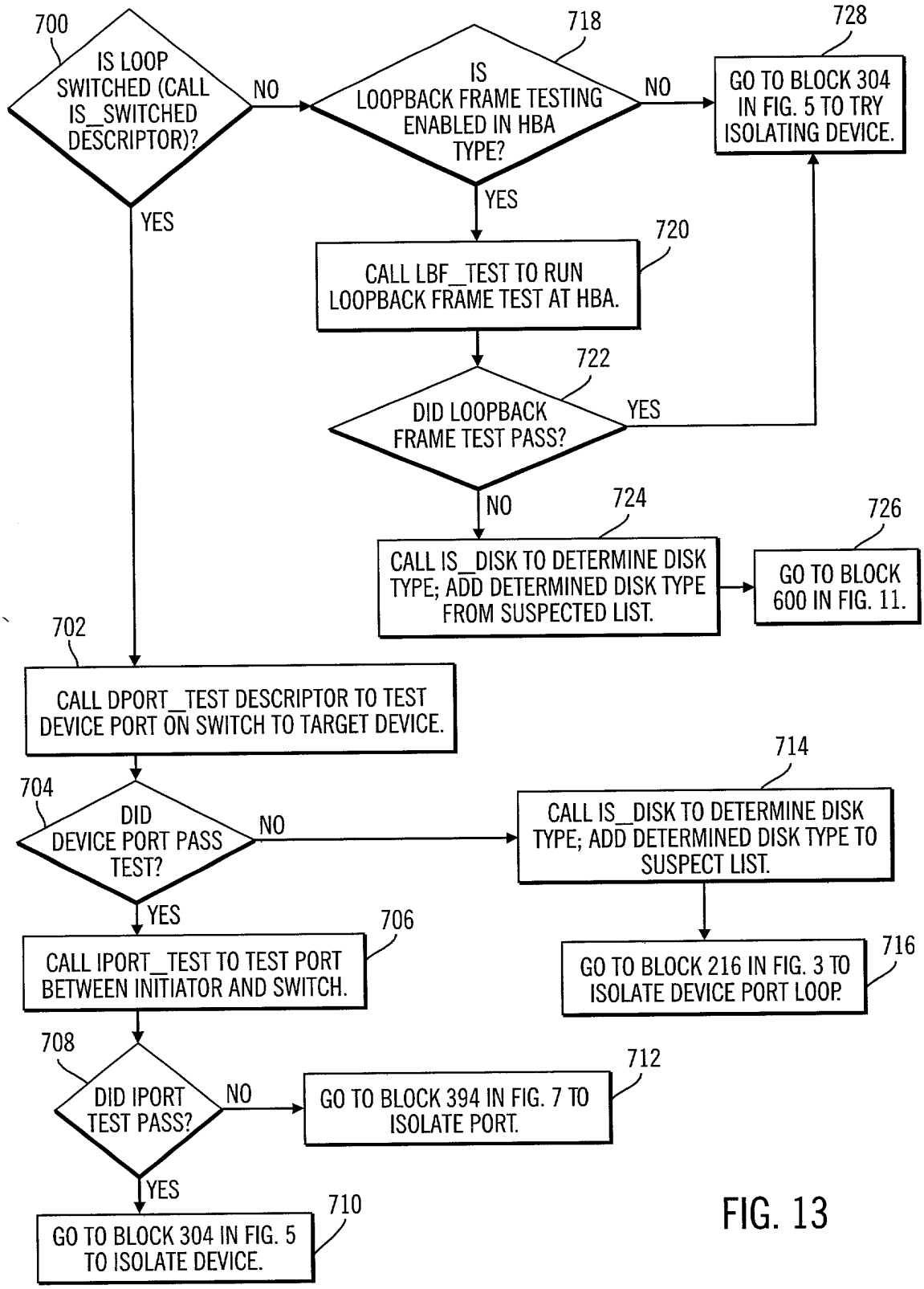
700
IS LOOP SWITCHED (CALL IS_SWITCHED DESCRIPTOR)?
NO
YES
718
IS LOOPBACK FRAME TESTING ENABLED IN HBA TYPE?
NO
YES
728
GO TO BLOCK 304 IN FIG. 5 TO TRY ISOLATING DEVICE.
720
CALL LBF_TEST TO RUN LOOPBACK FRAME TEST AT HBA.
722
DID LOOPBACK FRAME TEST PASS?
YES
NO
724
CALL IS_DISK TO DETERMINE DISK TYPE; ADD DETERMINED DISK TYPE FROM SUSPECTED LIST.
726
GO TO BLOCK 600 IN FIG. 11.
702
CALL DPORT_TEST DESCRIPTOR TO TEST DEVICE PORT ON SWITCH TO TARGET DEVICE.
704
DID DEVICE PORT PASS TEST?
NO
YES
714
CALL IS_DISK TO DETERMINE DISK TYPE; ADD DETERMINED DISK TYPE TO SUSPECT LIST.
706
CALL IPORT_TEST TO TEST PORT BETWEEN INITIATOR AND SWITCH.
716
GO TO BLOCK 216 IN FIG. 3 TO ISOLATE DEVICE PORT LOOP.
708
DID IPORT TEST PASS?
NO
YES
712
GO TO BLOCK 394 IN FIG. 7 TO ISOLATE PORT.
710
GO TO BLOCK 304 IN FIG. 5 TO ISOLATE DEVICE.

FIG. 13